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Sunflowerseed in the USSR: Production, Processing, and Trade

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Preface

This publication focuses on the Soviet Union's oilseeds sector, including the production, marketing, processing, utilization, and trade of sunflowerseeds and their products. The report is based on two official visits to the USSR by the author and on the author's work as a Soviet analyst—formerly with the Economics, Statistics, and Cooperative Services and currently with the Foreign Agricultural Service.

The first trip was made during the period September 10 to October 3, 1976. The itinerary included Kishinev, in the Moldavian Soviet Socialist Republic; Moscow, Rostov, Krasnodar, Novorossisk, and Armavir, all in the Russian Soviet Federated Socialist Republic (RSFSR); and Donetsk and Kharkov, in the Ukraine. The members of the team were George E. Wanamaker, Foreign Agricultural Service, team leader; Donald Frahm, representing the National Soybean Processors Association; Judith G. Goldich, at that time with USDA's Economics, Statistics, and Cooperatives Service (formerly the Economic Research Service); John M. Ragsdale, representing the American Soybean Association; and Richard Widmer, representing the National Soybean Processors' Association.

The second trip was made during August 28 to September 19, 1978. The itinerary included Moscow; Odessa, Zaporozhe, and Voroshilovgrad, all in the Ukraine; and Krasnodar and Armavir, both in the RSFSR. Team members were Alan E. Holz, Foreign Agricultural Service, USDA team leader; Tom R. Medd, representing the National Soybean Processors Association; Tommy E. Thompson, Science and Education Administration, USDA; William Uhrig, representing the American Soybean Association; and the author. During each visit, meetings were held with the representatives of the Ministry of Agriculture and Ministry of Food. Various collective and state farms, processing plants, and experimental stations were also visited.

The author extends her thanks to her fellow team members as well as to analysts in both the Foreign Agricultural Service and Economics, Statistics, and Cooperatives Service for their assistance.

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Sunflowerseed in the USSR: Production, Processing, and Trade

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Summary

The USSR is the world's leading producer of sunflowerseed, and the world's largest exporter of sunflowerseed oil. The Soviets maintain this position in face of a production decline noticeable in the 1970's.

Sunflowers are grown throughout a wide geographic area of the country, and generally occupy about 4.5 million hectares (1 hectare = 2.47 acres). Despite an increasing demand for vegetable oil in the country, the Soviets do not foresee any important expansion in planted area. Increases in production are to be achieved by raising yields. Traditionally, Soviet seed breeders have relied on open-pollinated varieties of sunflowers, although interest in hybrids is growing. Some Soviet scientists believe hybridization may be the only way to develop varieties sufficiently resistant to various diseases and pests which currently affect production.

Standardized cultivation practices have been developed for various regions of the Soviet Union. Although these methods are strongly recommended, Soviet farms frequently fail to follow them.

Sunflowerseed is an extremely profitable product for Soviet farms. A complicated payment and bonus system exists to encourage production and sales to the State. Because of increasing mechanization, chemicalization, and labor costs, the cost of producing sunflowers has risen substantially in the last two decades.

Sunflowerseed is processed in State-owned oilmills in the USSR. Crush capacity is rising somewhat, and is targeted to reach 10 million metric tons by the end of the current 5-year plan (1976-80).

USSR SUNFLOWERSEED PRODUCTION

Sunflowerseed is the basic oilseed crop in the Soviet Union. Although sunflowers are native to the southwestern part of North America, much of the research and improvement work on the crop was carried out in the USSR; and as early as the 1880's, sunflower area in Russia totaled close to 1.5 million hectares. Production in recent years has ranged from 5 to 7 million tons.

Sunflowers are raised in a rather wide area of the Soviet Union, stretching from the southwestern Ukraine and Moldavia eastward through the Ukraine and north Caucasus, and north and east through the Volga region and parts of Kazakhstan.

Sunflower area in Moldavia is decreasing at present; grapes, orchards, and soybeans are replacing the crop there. The area is about 170,000 hectares, compared with an area of more than 200,000 hectares in the sixties. In the Ukraine, the area is around 1.7 million hectares. When winter wheat does not overwinter satisfactorily, it is sometimes replanted with sunflowers. The North Caucasus[1] accounts for another 900,000 to 1 million hectares, with relatively stable yields. In the Central Blacksoil region, including Belgorod, Voronezh, Lipetsk, and Tambov Oblasts,[2] around 450,000 hectares of sunflowers are planted.

The Volga region accounts for 600,000 to 900,000 hectares. Yields are extremely variable here due both to the frequency of drought and the relative shortness of the growing season. The Altay and Kazakhstan account for another 200,000 hectares.

Soviet scientists do not foresee any important increases in sunflower plantings or change in their distribution within the Soviet Union. Soil and climate conditions dictate the boundaries of sunflower planting at present. Fairly severe disease and pest infestations, which necessitate relatively long rotation

[1] Includes Krasnodar and Stavropol Krays, Rostov Oblast, and the Dagestan, Kabardino-Balkar, North Ossetian and Chechen-Ingush Autonomous Soviet Socialist Republics.

[2] Kursk Oblast is also part of the Central Blacksoil region, but no sunflower plantings are reported there.

periods, also will tend to limit increases in seeded area.

Trends in Production

Sunflowerseed production in the USSR has actually declined since the second half of the 1960's, when it averaged 6.4 million tons annually. Output averaged 6.0 million tons during 1971-75, and 5.3 million tons during the opening 3 years of the current 5-year plan. The Soviets had planned for sunflowerseed production to average 7.6 million tons during 1976-80. The Soviets will be unable to attain this goal, and prospects for the 1980's remain uncertain. Soviet sunflowerseed breeders believe that yields in the USSR may eventually stabilize at close to 16 quintals per hectare (with ideal weather, the very best Soviet open-pollinated varieties can yield 42 to 44 quintals per hectare). If the 16-quintal average were achieved on an area of 4.8 million hectares—slightly more than the present area—the Soviets could count on around 8 million tons of sunflowerseed production annually.

Soviet breeders and geneticists have done substantial work in developing open-pollinated varieties. Soviet sunflowerseed breeding philosophy seems to be shifting toward concern for increased yield from a dominant concern about oil content. Breeding for high oil content involves selection for thinner seed coats; such seed is more susceptible to cracking, which allows the oil in the seed to oxidize more easily. Scientists at the Pustovoit Institute in Krasnodar recognize that seed damage (and oxidation of seed oil before crushing) will occur if oil content is increased much more at the expense of seed coat thickness.

Broomrape, or *orobanche,* is a serious pest in Soviet sunflower fields. Scientists know there are at least two races of this organism, and believe the more virulent race is spreading. A continuous selection system for resistance to this organism is being used, but results have been limited.

Insects are relatively minor pests. Although there was some concern about aphid damage in 1978, evidently damage was very slight. Certain sunflower moths have appeared in the western Ukraine and Moldavia.

Interest in breeding hybrid sunflower varieties in the USSR is widespread. At all three research centers[3] visited in 1978, many questions concerning hybrids were asked by both sides.. In the USSR, there is currently wide use of the Pustovoit plant-breeding system to produce high-oil, open-pollinated varieties. Soviet interest in hybrids stems from concerns about uniform maturity, disease resistance, and yield. Since hybrids were produced from homozygous lines that result in uniform F_1 populations, the plants mature together, and harvest losses are reduced. Hybrid breeding programs also utilize dominant disease-resistant genes more readily because one parent homozygous for these genes imparts a resistance to all F_1 seed. In *Helianthus,* many forms of disease resistance are conditioned by dominant genes. And, of course, hybrids utilize hybrid vigor more directly than any other kind of varieties.

Despite their interest in hybrids, the Soviets continue to rely on two main varieties of sunflowers—Peredovik and Armavir 3497. They are attempting to develop varieties resistant to broomrape and diseases by using wild and domestic species as genetic source material. Soviets also are trying to develop resistance to rust and downy mildew, and they have one variety, Progress, which shows resistance to downy mildew, broomrape, and sunflower head moth.

One new high-oleic variety, Pervenets, is now being tested. The new variety produces oil of high oleic acid content similar to olive oil. Soviet nutritionists believe that the USSR should increase consumption of the oleic oil, which is relatively low in saturated acids. The new variety contains about 70 to 75 percent oleic acid (compared with about 25 percent averaged in other varieties), 20 percent linoleic acid, and 10 percent saturated acids. A similar ratio is observed in olive oil. The new variety was developed in the course of testing other varieties.

Interest in producing this variety is strong. Farms will be paid a 20-percent bonus for growing Pervenets. In 3 years, the Soviet breeders think this variety could be growing virtually throughout the country. Pervenets seed has not been made available for independent testing in the United States.

Cultural Practices

Optimal cultivation practices for sunflowers have been worked out for each region of the country. Research on seed breeding and crop cultivation is carried out under the direction of research institutes. There are two types in the Soviet Union. The first is an all-union institute which specializes in a single crop for all regions of the country. The second is a zonal institute which develops crops regionalized for that zone. The Pustovoit Institute in Krasnodar is part of the All-Union Academy of Agricultural Sciences of the USSR. Research work on oil crops is carried out in 27 zonal institutes whose activities are coordinated by the Pustovoit Institute. As research on production techniques continues, certain general practices exist for most of the main sunflower regions of the USSR.

Rotational periods. These periods are supposed to be rather long, varying from 1 in 8 to as long as 1 in 12 years, depending on disease and pests in a given region. Winter grain is the preferred predecessor crop.

[3]The Michurin Institute of Odessa, a new center at Zaporozhe, and the Pustovoit Institute at Krasnodar.

Long rotation is recommended to control soil and waterborne disease, including downy mildew, sclerotina or white rot, grey rot, verticilium wilt, phoma head rot, rhizopus, rust, and broomrape.

Discussions with farm directors and farmers in both 1976 and 1978 indicated that farmers were aware of the importance of long rotation periods. Rotation periods are often shortened by the farms, however, since sunflowerseeds are extremely profitable. Typical rotation schemes, as recommended for the northern section of Krasnodar Kray, are:

Rotation I	Rotation II
Clean fallow	Occupied fallow
Winter wheat	Winter wheat
Winter wheat	Sugarbeet and castor
Sunflowers	Spring grain
Winter wheat	Winter wheat
Winter wheat	Corn for silage
Corn for silage	Winter wheat
Winter wheat	Winter wheat
Corn for grain, castor, hemp	Sunflower
Spring wheat, spring barley	Winter wheat
Reserve field of perennial grass	Winter wheat
	Hemp

Seedbed preparation. Sunflower generally follows winter wheat in Soviet rotation systems. Depending on soil type, fields are generally ploughed to a depth of 25 to 30 centimeters as soon after the wheat is harvested as possible—usually following broadcast application of fertilizer. The land may also be harrowed a number of times to help destroy weeds. Farmers generally harrow the land as early as possible in the spring, especially when work was not completed the preceding fall.

The autumn fieldwork and fallowing permit improved soil moisture retention and discourage weeds. Chemical weedkillers are available in limited quantities, and are seldom used on sunflowers. As in the United States, the purpose of soil preparation is to provide a firm seedbed with adequate moisture for seed germination, and with a minimum of weeds.

Planting. Sunflower is planted when soil temperature reaches 10 degrees Celsius at a depth of 10 centimeters. Prior to planting, seed may be treated with tetramethylthiuram disulfide at a rate of 2 to 3 kilograms per ton of seed. Seeding rates vary with location, but are done at a rate of 6 to 8 kilograms per hectare, generally in 70-centimeter rows. Seedbed depth varies from 6 to 10 centimeters, with the deeper sowing being recommended for dry land. Several cultivations are recommended after sowing, depending on moisture and weed situations.

Fertilizer application. Fertilizer is recommended for sunflowers, which remove as much nutrient from the land as cereal crops. However, the sunflower plant's extensive root system helps make good use of whatever nutrients are available, whether supplemental fertilizer is applied or not. In the USSR, fertilizer is generally broadcast in the fall prior to planting.

Harvesting. Under the weather conditions encountered in the USSR, harvesting often presents substantial difficulties. Sunflowerseed completes oil formation when moisture content is about 35 percent. At this stage of development, the sunflower plant is still quite green. Because of insufficient drying capacity and inadequate storage facilities, Soviet farmers try to wait for natural dessication of the plant to occur after the first hard frost. Official recommendations call for the farmers to begin harvest when seed-moisture levels are at 12 to 14 percent.

Harvesting at this stage minimizes losses from shattering. Harvested seed will be relatively free from weed admixtures and storage is simplified, as relatively little drying will be necessary to reduce moisture content to the 10-percent maximum recommended for short-term storage, or 7- to 8-percent maximum for long-term and planting seed storage. Harvesting is generally done with a modified grain combine.

Problems. A number of natural and manmade factors have combined to reduce Soviet sunflower production in the past few years. Natural problems include:

- Relative shortness of the growing season. If sunflower planting is delayed by late spring or rainy weather during planting, or if maturation is delayed by a cool summer (as in 1978), the start of harvesting can be delayed by as much as 2 to 3 weeks. Some fields may not ripen before a killing frost. Unfortunately, late fall is a rainy period for much of the Soviet sunflower area, and wet weather often interferes with harvesting. Sometimes, sunflower areas have to be abandoned because it is impossible to get machines in the fields before heavy snow ruins the crop and makes harvesting impractical.
- Increasing disease problems, which are mainly due to the continued reliance on a very few, open-pollinated varieties. In the United States, disease resistance is developed through the use of hybrids, but very little hybridization work on sunflower has been done in the Soviet Union.

Manmade problems are generally the result of neglect. They include:

- Weeds. Relatively small amounts of chemical herbicides are available for use on sunflower. Soviet farmers tend to skip needed post-emergence cultivations.
- Diseases. These are worsened by shortening rotation periods, and reliance on a few varieties.
- Substantial seed losses. These are caused by careless harvesting.

SUNFLOWER MARKETING

Sunflowerseed is an extremely lucrative product for Soviet farms. Procurement prices—the basic price the Government pays per ton of delivered seed at specified conditions—are relatively high in comparison with costs. Each farm is given a procurement target or goal—based on past achievements—by the local ministry of agriculture. The farm is required to deliver that volume of sunflowerseed to a State procurement point for a fixed payment per ton.

After the farm meets its procurement goal, and sets aside seed for planting the next year, it can apportion the remainder of its output between above-plan sales to the Government (for which it receives substantial bonuses), sales to farmers for direct consumption, and a reserve for custom crush. At harvesttime, sunflowerseed is sold and moved either to procurement points or to oilmills (if the farm is located within 50 kilometers of a mill) as quickly as possible. Small amounts may be delivered to the Government as late as January.

Procurement prices vary from region to region. In the Ukraine and Moldavia, as well as the North Caucasus, however, the basic procurement price is about 157 rubles per ton for sunflowers. Farms receive a 12-percent bonus for producing superelite or elite (first or second reproduction of high-oil varieties) sunflowerseed. In addition, farms receive a 50-percent bonus payment for each above-plan ton of sunflowerseed they sell to the Government. Basic conditions for sunflowerseed vary somewhat from region to region, but allowable moisture content in most areas ranges from 12 to 14 percent. When weather conditions are very unfavorable, farms deliver sunflowerseed with as much as 19 percent moisture. In addition, 1 to 2 percent admixture of trash and waste is also permitted. Farms are docked for excess moisture, and receive a bonus for delivering sunflowerseed with below-norm moisture.

Some comparative information on expenses and income for State farms are shown in tables 10 and 11. The cost of producing sunflowers in the Soviet Union has risen substantially in the last 20 years, as shown in table 12.

SUNFLOWER PROCESSING AND UTILIZATION

Sunflowerseeds are delivered by the farms to the State as quickly as possible. If the farm is located within 50 kilometers of an oilseed crushing plant, it delivers directly to the plant; if not, it delivers to a specified procurement point. Insofar as possible, farms try to dry sunflowerseed down to acceptable moisture levels by using grain dryers. Farms can be docked for the delivery of sunflowerseeds with excess moisture content. If the sunflower processing plant, which is a part of the Ministry of the Food Industry, has to store the seed for any period of time, it dries the seed down to 7 to 8 percent moisture. The sunflowerseed is dehulled and crushed by means of either a prepress and extractor or a mechanical press system. Hulls are discarded as trash or are used as fuel for the grain dryers. So-called cold press sunflowerseed oil generally is not processed further; it is delivered to bottlers and distributed as is. Hexane is used to extract additional oil from the sunflower cake after mechanical pressing; extracted oil is further processed for use in margarine or soap.

Soviet oilseed crushing capacity was reported at 8 to 9 million tons, about 50 to 55 percent of which is for sunflowerseed. Soybean crushing capacity, designed specifically for soybeans, was reported at 300,000 tons. However, most plants in the Soviet Union are combination expeller-extractor plants (such as the Armavir operation) and are capable of handling soybeans.

During the current 5-year plan, oilseed crush capacity is planned to reach 10 million tons. Increased crushing capacity is planned for areas where raw material is available. New plants with a capacity of 1,500 tons per day are being planned and built now, although in the eleventh 5-year plan period (1981-85) the Soviets would like to increase optimal capacity to 2,000 tons per day.

New plants being built for soybean and cottonseed processing will be of the direct extraction type, those that omit mechanical pressing operation. The Soviets hope to build some direct extraction facilities for sunflowers during the next 5-year plan. In addition, they intend to build switch plants—in which the mechanical pressing operation can be used or skipped—in the European USSR and central Asia. In 1980 the Ministry of the Food Industry hopes to build specialized soybean plants.

Processing and Mill Margins

Information on processing and mill margins is sketchy and contradictory. Data gathered in 1976 and 1978 suggest that crushing margins are similar to U.S. operations, but not as efficient.

SUNFLOWERSEED AND PRODUCT TRADE

Total USSR oilseed production[4] as well as sunflowerseed production is severely limited by climatic conditions, and output currently ranges from 11 to 13 million tons per year. Sunflowerseed accounts for 5 to 7 million tons of this total, making the USSR the world's largest producer of sunflowerseed.

[4] Including oilseeds and seeds from fiber crops and from miscellaneous crops.

Soviet sunflowerseed exports peaked at close to 400,000 tons in the late sixties, but dropped off sharply in the seventies. No seed was exported in 1976, 1977, or 1978, and none is expected to be exported in 1979. During the sixties, export markets included Finland, Italy, Japan, and the Federal Republic of Germany.

Somewhat surprisingly, the USSR exported significant quantities of oilmeal and oil cake in the fifties and sixties. While information on the type of oilmeal shipped is not available, exports was almost certainly a combination of sunflowerseed meal and cottonseed meal. The Soviets shipped a peak of 575,200 tons of oilseed meal in 1959, when production is estimated to have totaled only about 2 million tons. Exports declined slowly after that time and apparently they have been discontinued.

The Soviet Union has been one of the world's most important exporters of vegetable oil, a position which it maintains despite the decline of exports in recent years. Soviet exports of sunflowerseed oil expanded sharply beginning in 1965. Exports declined in 1969, however, and generally they have remained in the 300,000- to 500,000-ton range since then.

TABLE 1–USSR SUNFLOWER AREA, 1971-77

[In 1,000 hectares]

Region	1971	1972	1973	1974	1975	1976	1977	1978
RSFSR:								
Northwest	0	0	0	0	0	0	0	–
Central	0	0	0	0	0	0	0	–
Volga-Vyatka	0	0	0	1	1	1	0	–
North Caucasus	1,051	1,096	1,097	1,094	901	958	–	–
Central Blacksoil	480	449	511	507	394	487	–	–
Volga	779	571	868	877	618	877	–	–
Urals	101	84	128	136	82	133	–	–
West Siberia	108	103	89	41	64	71	–	–
East Siberia	0	0	0	0	0	0	0	–
Far East	0	0	0	0	0	0	0	–
RSFSR total	2,520	2,303	2,693	2,656	2,060	2,528	2,594	–
Ukraine								
Donets-Dnepr	1,114	1,165	1,148	1,150	1,116	1,143	–	–
Southwest	93	93	90	88	84	80	–	–
South	456	490	490	480	472	480	–	–
Ukraine total	1,663	1,748	1,728	1,718	1,672	1,703	1,691	–
Baltics	0	0	0	0	0	0	0	–
Belorussia	0	0	0	0	0	0	0	–
Moldavia	193	218	202	202	194	188	181	–
Kazakhstan	102	103	100	88	99	97	90	–
Transcaucasus	19	20	20	20	18	16	16	–
Central Asia	2	2	2	2	2	2	2	–
USSR total	4,498	4,394	4,745	4,686	4,045	4,354	4,574	4,560

Source: USSR official statistics.

TABLE 2–USSR SUNFLOWERSEED YIELDS,[1] 1971-77

[In metric tons per hectare]

Region	1971	1972	1973	1974	1975	1976	1977	1978
RSFSR:								
Northwest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	–
Central	.00	.00	.00	.00	.00	.00	.00	–
Volga-Vyatka	.00	.00	.00	.00	.00	.00	.00	–
North Caucasus	1.34	1.19	1.67	1.54	1.40	–	–	–
Central Blacksoil	1.09	.94	1.37	1.15	1.27	–	–	–
Volga	.71	.58	1.14	1.13	.64	–	–	–
Urals	.47	.14	.97	.98	.04	–	–	–
West Siberia	.74	.68	.51	.15	.53	–	–	–
East Siberia	.00	.00	.00	.00	.00	.00	.00	–
Far East	.00	.00	.00	.00	.00	.00	.00	–
RSFSR total	1.04	0.93	1.37	1.28	1.06	1.12	1.07	–
Ukraine								
Donets-Dnepr	1.65	1.36	1.86	1.84	1.49	–	–	–
Southwest	1.35	1.76	1.77	1.73	1.85	–	–	–
South	1.48	1.33	1.76	1.50	1.19	–	–	–
Ukraine total	1.58	1.37	1.83	1.74	1.43	1.24	1.58	–
Baltics	.00	.00	.00	.00	.00	.00	.00	–
Belorussia	.00	.00	.00	.00	.00	.00	.00	–
Moldavia	1.65	1.78	2.05	1.72	1.64	1.20	1.85	–
Kazakhstan	.88	.88	.92	.12	.76	.90	1.10	–
Transcaucasus	.32	1.15	1.10	1.25	.78	1.06	–	–
Central Asia	1.00	1.00	1.00	1.00	1.00	1.00	–	–
USSR total	1.26	1.15	1.56	1.45	1.23	1.21	1.29	1.16

[1] Yield is production divided by area.

Source: Derived from USSR official statistics.

TABLE 3–USSR SUNFLOWERSEED PRODUCTION, 1971-77

[In 1,000 metric tons]

Region	1971	1972	1973	1974	1975	1976	1977	1978
RSFSR:								
Northwest	0	0	0	0	0	0	0	–
Central	0	0	0	0	0	0	0	–
Volga-Vyatka	0	0	0	0	0	0	0	–
North Caucasus	1,406	1,307	1,835	1,689	1,260	–	–	–
Central Blacksoil	522	423	699	584	500	–	–	–
Volga	555	332	993	993	393	–	–	–
Urals	47	12	124	133	3	–	–	–
West Siberia	80	70	45	6	34	–	–	–
East Siberia	0	0	0	0	0	0	0	–
Far East	0	0	0	0	0	0	0	–
RSFSR total	2,611	2,145	3,698	3,407	2,193	2,831	2,779	–
Ukraine								
Donets-Dnepr	1,834	1,584	2,131	2,119	1,666	–	–	–
Southwest	126	164	159	152	155	–	–	–
South	674	650	864	718	563	–	–	–
Ukraine total	2,634	2,398	3,154	2,989	2,385	2,111	2,675	–
Baltics	0	0	0	0	0	0	0	–
Belorussia	0	0	0	0	0	0	0	–
Moldavia	319	387	415	347	319	226	334	–
Kazakhstan	90	91	92	11	75	87	99	
Transcaucasus	6	23	22	25	14	17	–	–
Central Asia	2	2	2	2	2	2	–	–
USSR total	5,663	5,048	7,385	6,784	4,975	5,277	5,904	5,310

Source: USSR official statistics.

TABLE 4–USSR SUNFLOWERSEED PROCUREMENTS, 1971-77

[In 1,000 metric tons]

Republic	1971	1972	1973	1974	1975	1976	1977	1978
RSFSR	2,010	1,594	2,831	2,634	1,675	2,102	2,147	–
Ukraine	2,017	1,795	2,359	2,340	1,875	1,436	1,984	–
Kazakhstan	67	68	72	4	54	62	75	–
Georgia	4	16	16	16	10	11	10	–
Moldavia	261	280	275	234	227	159	230	–
Other	0	0	0	0	0	0	0	–
USSR total	4,359	3,753	5,553	5,228	3,841	3,770	4,446	4,000

Source: USSR official statistics.

TABLE 5–STRUCTURE OF THE PRIME COST OF SUNFLOWERSEED IN USSR STATE FARMS IN 1970

Region	Prime cost	Elements of expenses					
		Labor	Machinery	Seed	Fertilizer	Other costs	Overhead
RSFSR:	*Rubles per quintal*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*
Central Blacksoil	6.31	23.8	34.7	4.9	6.2	11.4	19.0
Volga	6.63	24.1	39.7	5.5	3.5	11.2	16.0
North Caucasus	5.89	27.5	34.6	3.4	7.0	10.2	17.3
Urals	8.89	20.0	38.8	5.8	0.8	21.6	12.8
West Siberia	9.80	24.2	40.9	5.4	1.6	8.6	19.3
RSFSR	7.18	25.5	36.8	4.4	5.3	10.7	17.3
Ukraine	5.71	29.6	30.1	2.3	7.9	14.0	16.1
Moldavia	6.82	38.6	24.8	4.1	6.6	11.7	14.2
Georgia	20.00	27.5	17.5	7.5	([1])	7.5	40.0
Kazakhstan	7.65	23.3	40.5	5.1	6.3	8.7	16.1
USSR	6.60	27.0	34.4	3.7	6.4	11.7	16.8

[1] Not available.

Source: *Podsolnechnik (Sunflower)*, Moscow, Kolos, 1975, p. 542.

TABLE 6–PRIME COST OF PRODUCTION OF SUNFLOWERSEED PER QUINTAL ON STATE FARMS

Region	Average			1971-75 as share of 1962-65
	1962-65	1966-70	1971-75	
RSFSR:	*Rubles per quintal*	*Rubles per quintal*	*Rubles per quintal*	*Percent*
Central Blacksoil	3.42	5.76	7.58	222
Volga	4.78	6.32	8.01	168
North Caucasus	3.17	5.10	6.92	218
Krasnodar Kray	3.03	4.66	5.64	186
Urals	6.61	7.61	7.61	115
West Siberia	10.03	8.59	8.94	89
RSFSR Total	3.85	5.86	7.64	198
Ukraine	3.90	6.99	6.43	165
Georgia	(1)	9.65	18.91	[2] 196
Moldavia	4.39	6.66	7.87	179
Kazakhstan	7.17	7.65	8.49	118
USSR total	4.00	5.64	7.28	182

[1] Not available. [2] As a percent of 1966-70.

Source: *Ekonomika Proizvodstva Maslichnikh Kultur.* Moscow, Kolos, 1978, p. 65.

TABLE 7–COST OF PRODUCTION, INCOME, AND PROFITS ON SUNFLOWERSEED PER QUINTAL, ON STATE FARMS, 1971-75 AVERAGE

[In rubles per quintal]

Item	Expenses	Income	Profit
RSFSR:			
Central Blacksoil	7.58	17.68	10.10
Volga	8.01	22.41	14.40
North Caucasus	6.92	19.02	12.10
Krasnodar Kray	5.64	17.64	12.00
Urals	7.61	22.81	15.20
West Siberia	8.94	20.04	11.10
RSFSR total	7.64	20.34	12.70
Ukraine	6.43	17.93	11.50
Moldavia	7.87	17.37	9.50
Georgia	18.91	21.71	2.80
Kazakhstan	8.49	19.89	11.40
USSR total	7.28	19.38	12.10

Source: Derived from *Ekonomika Proizvodstva Maslichnikh Kultur,* pp. 54-65.

TABLE 8–USSR OILSEED EXPORTS BY TYPE, 5-YEAR AVERAGES 1956-75, AND ANNUAL 1971-77

[In 1,000 metric tons]

Commodity	Average			1971	1972	1973	1974	1975	Average	1976	1977
	1956-60	1961-65	1966-70						1971-75		
Cottonseed	0.0	0.0	25.8	29.0	25.1	9.2	41.6	51.8	31.3	49.8	28.4
Soybeans	6.2	2.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Sunflowerseed	56.6	96.8	259.2	84.1	74.0	73.1	63.4	61.0	71.1	.0	.0
Unspecified[1]	7.3	8.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
Total[2]	70.1	107.3	[2] 291.2	[2] 113.1	[2] 99.1	[2] 82.3	[2] 105.0	[2] 112.8	[2] 102.5	[2] 49.8	[2] 28.4

[1] Residual believed to be mostly cottonseed. [2] Total not reported after 1969. Volume estimate is sum of individual commodities.

Source: USSR official statistics, except where footnoted.

TABLE 9–USSR SUNFLOWERSEED EXPORTS, 5-YEAR AVERAGES 1956-75, AND ANNUAL 1971-77

[In 1,000 metric tons]

Destination	Average			1971	1972	1973	1974	1975	Average	1976	1977
	1956-60	1961-65	1966-70						1971-75		
Denmark	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Federal Republic of Germany	.0	.0	3.1	.0	.0	.0	.0	.0	.0	.0	.0
Finland	.0	.0	15.8	.1	.0	.0	.0	.0	.0	.0	.0
Italy	.0	.0	25.7	.0	.0	.0	.0	.0	.0	.0	.0
Japan	.0	.0	44.9	.0	.0	.0	.0	.0	.0	.0	.0
Lebanon	.0	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0
Netherlands	.0	.0	1.3	.0	.0	.0	.0	.0	.0	.0	.0
Spain	.0	.0	2.1	.0	.0	.0	.0	.0	.0	.0	.0
CMEA:											
Czechoslovakia	23.8	35.8	54.0	.0	.0	.0	.0	.0	.0	.0	.0
GDR	32.3	60.4	82.4	84.0	74.0	73.1	63.4	61.0	71.1	.0	.0
Hungary	.0	.0	18.0	.0	.0	.0	.0	.0	.0	.0	.0
CMEA total	56.1	96.3	154.4	84.0	74.0	73.1	63.4	61.0	71.1	.0	.0
Other[1]	.5	.4	11.3	.0	.0	.0	.0	.0	.0	.0	.0
World total	56.6	96.8	259.2	84.1	74.0	73.1	63.4	61.0	71.1	.0	.0

[1] Residual.

Source: USSR official statistics.

TABLE 10–USSR SOYBEAN IMPORTS, 5-YEAR AVERAGES 1956-75 AND ANNUAL 1971-77

[In 1,000 metric tons]

Country	Average			1971	1972	1973	1974	1975	Average	1976	1977
	1956-60	1961-65	1966-70						1971-75		
Brazil	0.0	0.0	0.0	0.0	0.0	155.5	0.0	348.6	100.8	1,344.4	568.7
China	519.2	2.1	0	.0	.0	0.0	.0	.0	.0	.0	.0
United States	.0	.0	0	.0	[1] 399.6	[1]549.8	.0	[1]14.7	192.8	424.7	795.4
Other[2]	.0	18.7	.0	.0	.0	.0	.0	.0	.0	.0	.0
Total	519.2	20.7	0.0	0.0	[3]399.6	[3]705.3	0.0	[3]363.3	293.6	1,769.1	1,364.1

[1] Official U.S. statistics. Transshipments included. [2] Residual. [3] Totals not reported. Volume estimates are sums of individual country data.

Source: USSR official statistics, except where footnoted.

TABLE 11–USSR SUNFLOWERSEED OIL EXPORTS, 5-YEAR AVERAGES 1956-75 AND ANNUAL 1971-77

[In 1,000 metric tons]

Destination	Average			1971	1972	1973	1974	1975	Average	1976	1977
	1956-60	1961-65	1966-70						1971-75		
Algeria	0.0	7.3	27.0	32.9	41.0	19.3	38.8	18.5	30.1	0.0	0.0
Bangladesh	.0	.0	.0	4.0	.0	4.7	4.5	.0	2.6	.0	.0
Belgium	.0	2.9	6.1	11.5	.0	.0	4.5	3.0	3.8	7.0	1.5
Brazil	.0	.0	1.9	.0	.0	.0	.0	.0	.0	.0	.0
Canada	.0	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0
Cyprus	.0	.0	.0	.0	.8	.0	.0	.0	.2	.0	.0
Denmark	.0	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0
Egypt	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
Federal Republic of Germany[1]	.0	.0	5.7	3.0	82.8	79.9	100.3	81.1	69.4	74.5	38.6
France	.0	.0	1.5	8.4	21.2	22.6	60.6	71.6	36.9	48.0	15.8
India	.0	.0	2.0	0.0	.0	.0	.0	.0	.0	.0	.0
Iran	.0	.0	29.3	.0	10.0	10.3	36.6	27.7	16.9	2.4	.0
Morocco	.0	.8	22.1	4.2	20.2	22.8	.0	.0	9.4	.0	.0
Netherlands	.0	.4	21.6	12.6	10.7	6.8	9.0	6.3	9.1	10.0	10.9
Pakistan	.0	.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0
Peru	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0
Spain	.0	6.2	1.1	.0	.0	.0	5.8	25.6	6.3	1.1	1.4
Switzerland	.0	.0	.3	3.6	2.8	2.6	3.5	1.9	2.9	0.8	25.6
Tunisia	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0
Turkey	.0	.0	2.8	.0	.0	.0	5.0	.0	1.0	.0	.0
Yugoslavia	.0	.0	29.0	.0	.0	.0	.0	.0	.0	.0	.0
CMEA:											
Bulgaria	.0	.0	23.0	.0	.0	.0	.0	.0	.0	.0	.0
Cuba	.0	.0	.0	.0	63.5	48.1	65.3	60.7	47.5	57.3	72.6
Czechoslovakia	.0	17.3	35.9	28.4	27.8	27.6	31.2	24.7	27.9	30.6	33.3
GDR	.0	.0	.0	.0	47.5	43.1	57.0	26.1	34.7	19.1	5.5
Mongolia	.0	.0	.0	.0	.0	.0	.8	.8	.3	1.3	.5
Poland	.0	.0	.0	.0	22.0	25.7	24.5	20.5	18.5	30.0	17.4
CMEA total	.0	17.3	58.9	28.4	160.8	144.5	178.8	132.8	129.1	138.3	129.3
Other[2]	18.4	144.7	335.6	267.9	40.6	26.4	29.2	14.8	75.8	10.4	7.6
World total	[3]18.4	[3]180.4	563.7	378.6	394.4	342.0	481.2	387.8	396.8	292.8	230.9

[1] Includes shipments to West Berlin, reported separately. [2] Residual. [3] FAO Trade Yearbook, various issues.

Source: USSR official statistics, except where footnoted.

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